

Linear Programming

When solving a problem with a mathematical model, it often happens that the optimal solution (max. or min.) subject to the given constraints has to be found.

Constraints = set of linear inequalities.

Objective = quantity that needs to be optimized.

The optimal solution can be found using a method called linear programming.

Steps needed:

1. **Interpret the problem.** Draw a table if possible.
2. **Assign the variables:** x, y for unknowns and a variable for quantity that has to be optimized.
3. Set up the model: **write down the objective and constraints.**
4. **Graph the constraints.** Solve the constraints for y and graph them on the same window.
5. **Find the feasible region.** The lines divide the plane into a few regions. Just one of them is a region that will satisfy **all** of the constraints. Such region is called the feasible region. To find it, plug a point from the inside of each region (NOT from the lines) in all of the constraints. Just one point will satisfy **all** the constraints.
6. **Find the corner points** of your feasible region. These points will be the intersections of some of the lines, x or y intercepts. Then, plug all the corner points into the OBJECTIVE equation. Compare the values: the smallest value is the minimum, the largest is the maximum value.
7. **Interpret the solution** in terms of the problem. Write down a complete sentence.